



Designation: A 101 – 93 (Reapproved 2000)

Standard Specification for Ferrochromium¹

This standard is issued under the fixed designation A 101; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This specification covers two types of ferrochromium designated as high carbon and low carbon, the latter including nitrogen-bearing and vacuum grades.

1.2 The values stated in inch-pound units are to be regarded as the standard. The SI units given in parentheses are for information only.

2. Referenced Documents

2.1 ASTM Standards:

E 29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications²

E 31 Methods for Chemical Analysis of Ferroalloys³

E 32 Practices for Sampling Ferroalloys and Steel Additives for Determination of Chemical Composition³

E 363 Test Methods for Chemical Analysis of Chromium and Ferrochromium⁴

3. Ordering Information

3.1 Orders for material under this specification shall include the following information:

3.1.1 Quantity,

3.1.2 Name of material,

3.1.3 ASTM designation and year of issue,

3.1.4 Grade,

3.1.5 Size, and

3.1.6 Requirements for packaging analysis reports, etc., as appropriate.

3.2 Although ferrochromium is purchased by total net weight the customary basis of payment is per pound of contained chromium.

4. Chemical Composition

4.1 The various grades shall conform to the requirements as to chemical composition specified in Table 1 and Table 2.

4.2 The manufacturer shall furnish an analysis of each shipment showing the elements specified in Table 1.

4.3 The values shown in Table 2 are expected maximums. Upon request of the purchaser, the manufacturer shall furnish an analysis for any of these elements on a cumulative basis over a period mutually agreed upon by the manufacturer and the purchaser.

5. Size

5.1 The various grades are available in sizes as listed in Table 3.

5.2 The sizes listed in Table 3 are typical, as shipped from the manufacturer's plant. These alloys exhibit varying degrees of friability; therefore, some attrition may be expected in transit, storage, and handling. A quantitative test is not available for rating relative friability of ferroalloys. A code system has been developed, therefore, for this purpose, and a number rating for each product type is shown in the last column of Table 3. Definitions applicable to these code numbers are given in the Appendix.

6. Sampling

6.1 The material shall be sampled in accordance with Practices E 32.

6.2 Other methods of sampling mutually agreed upon by the manufacturer and the purchaser may be used; however, in case of discrepancy, Practices E 32 shall be used for referee.

7. Chemical Analysis

7.1 The chemical analysis of the material shall be made in accordance with the procedure for the ferroalloys as described in Method E 31 and Test Methods E 363 or alternative methods that will yield equivalent results.

7.2 If alternative methods of analysis are used, in case of discrepancy, Method E 31 and Test Methods E 363 shall be used for referee.

¹ This specification is under the jurisdiction of ASTM Committee A-1 on Steel, Stainless Steel, and Related Alloys and is the direct responsibility of Subcommittee A01.18 on Castings.

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² Annual Book of ASTM Standards, Vol 14.02.

³ Annual Book of ASTM Standards, Vol 03.05.

⁴ Annual Book of ASTM Standards, Vol 03.06.

TABLE 1 Chemical Requirements^A

Type Ferrochromium	Composition, %						
	Grade	Chromium	Carbon	Silicon	Sulfur, max	Phosphorus, max	Nitrogen
High carbon	A	51.0–56.0	6.0–8.0	6.0 max	0.040	0.030	...
	B	56.0–62.0	6.0–8.0	8.0–14.0	0.050	0.030	...
	C	62.0 min	6.0–8.0	3.0 max	0.050	0.030	...
Low carbon	A	60.0–67.0	0.025 max	1.0–8.0	0.025	0.030	...
	B	67.0–75.0	0.025 max	1.0 max	0.025	0.030	...
	C	67.0–75.0	0.050 max	1.0 max	0.025	0.030	...
	D	67.0–75.0	0.75 max	1.0 max	0.025	0.030	...
Vacuum low carbon	E	66.0–70.0	0.015 max	2.0 max	0.030	0.030	...
	G	63.0–68.0	0.050 max	2.0 max	0.030	0.030	5.0–6.5
Nitrogen bearing		62.0–70.0	0.10 max	1.0 max	0.025	0.030	1.0–5.0

^AFor purposes of determining conformance with this specification, the reported analysis shall be rounded to the nearest unit in the last right-hand place of figures used in expressing the limiting value, in accordance with the rounding method of Recommended Practice E 29.

TABLE 2 Supplementary Chemical Requirements^A

Type	Composition, max, %					
	High Carbon		Low Carbon	Vacuum Low Carbon ^B		Nitrogen Bearing
Grade	A, B	C	All Grades	E	F	—
Nitrogen	0.050	0.050	0.12	0.050	^C	^C
Manganese	0.75	0.75	0.75	0.75	0.75	0.75
Nickel	0.50	0.50	0.50	0.50	0.50	0.50
Vanadium	0.50	0.50	0.50	0.50	0.50	0.50
Copper	0.050	0.050	0.050	0.050	0.050	0.050
Molybdenum	0.050	0.050	0.050	0.050	0.050	0.050
Columbium	0.050	0.050	0.050	0.050	0.050	0.050
Tantalum	0.050	0.050	0.050	0.050	0.050	0.050
Cobalt	0.10	0.10	0.10	0.10	0.10	0.10
Aluminum	0.25	0.25	0.10	0.10	0.10	0.10
Titanium	0.50	0.30	0.050	0.050	0.050	0.050
Zirconium	0.050	0.050	0.01	0.01	0.01	0.01
Antimony	0.01	0.01	0.01	0.01	0.01	0.01
Arsenic	0.005	0.005	0.005	0.005	0.005	0.005
Lead	0.005	0.005	0.005	0.005	0.005	0.005
Tin	0.005	0.005	0.005	0.005	0.005	0.005
Zinc	0.005	0.005	0.005	0.005	0.005	0.005
Boron	0.005	0.005	0.005	0.005	0.005	0.005
Silver	0.005	0.005	0.005	0.005	0.005	0.005
Bismuth	0.005	0.005	0.005	0.005	0.005	0.005

^AFor purposes of determining conformance with this specification, the reported analysis shall be rounded to the nearest unit in the last right-hand place of figures used in expressing the limiting value, in accordance with the rounding method of Recommended Practice E 29.

^BThe inert oxide ($\text{SiO}_2 + \text{CaO} + \text{MgO} + \text{Al}_2\text{O}_3$) content of vacuum low-carbon ferrochromium shall be specified as 3.50 % max.

^CSee Table 1.

7.3 Where no method is given in Methods E 31 or Test Methods E 363 for the analysis for a particular element, the analysis shall be made in accordance with a procedure agreed upon by the manufacturer and the purchaser.

8. Inspection

8.1 The manufacturer shall afford the inspector representing the purchaser all reasonable facilities, without charge, to satisfy him that the material is being furnished in accordance with this specification.

9. Rejection

9.1 Any claims or rejections shall be made to the manufacturer within 45 days from receipt of material by the purchaser.

10. Packaging and Package Marking

10.1 The material shall be packaged in sound containers, or shipped in bulk, in such a manner that none of the product is lost or contaminated in shipment.

10.2 Each package shall be identified with product name and other information required by OSHA regulations.

11. Keywords

11.1 ferroalloys; ferrochromium; high carbon; low carbon; nitrogen-bearing; vacuum low carbon



TABLE 3 Standard Sizes and Tolerances

Product	Standard Sizes	Tolerances	Friability Ratings
Ferrochromium:			
High-carbon	8 in. (200 mm) by 4 in. (100 mm) 6 in. (150 mm) by down 5 in. (125 mm) by 2 in. (50 mm) 4 in. (100 mm) by in. (12.5 mm) 3 in. (75 mm) by 1 in. (25 mm) 3 in. (75 mm) by ¼ in. (6.3 mm) ¼ in. (6.3 mm) by down 8 mesh (2.36 mm) by down	10 in. (250 mm), max 10 %, max, retained on 6-in. (150-mm) sieve 10 %, max, retained on 5-in. (125-mm) sieve 10 %, max, retained on 4-in. (100-mm) sieve 10 %, max, retained on 3-in. (75-mm) sieve 10 %, max, retained on 3-in. (75-mm) sieve 5 %, max, retained on ¼-in. (6.3-mm) sieve 5 %, max, retained on U.S. No. 8 (2.36-mm) sieve	10 %, max, passing 4-in. (100-mm) sieve 10 %, max, passing 2-in. (50-mm) sieve 10 %, max, passing ½-in. (12.5-mm) sieve 10 %, max, passing 1-in. (25-mm) sieve 10 %, max, passing ¼-in. (6.3-mm) sieve
Low-carbon	8 in. (200 mm) by down 8 in. (200 mm) by 4 in. (100 mm) 4 in. (100 mm) by down 3 in. (75 mm) by 1 in. (25 mm) 8 mesh (2.36 mm) by down brick or pellet	10 in. (250 mm), max 10 %, max, retained on 8-in. (200-mm) sieve 10 %, max, retained on 4-in. (100-mm) sieve 10 %, max, retained on 3-in. (75-mm) sieve 5 %, max, retained on U.S. No. 8 (2.36-mm) sieve designated by manufacturer	5 %, max, passing 4-in. (100-mm) sieve 10 %, max, passing 1-in. (25-mm) sieve
Vacuum low carbon			

APPENDIX

(Nonmandatory Information)

X1. FRIABILITY RATINGS

Code No.	Definition
1	Very tough materials which are susceptible to little, if any, breakage during shipment or handling. (Example: low carbon ferrochrome)
2	Some breakage of large pieces probable in shipping and handling. No appreciable fines produced from either lump or crushed sizes. (Example: chromium metal)
3	Appreciable reduction in size of large pieces possible in shipping and handling. No appreciable production of fines in handling of crushed sizes. (Example: ferrovanadium)
4	Appreciable reduction in size of large pieces upon repeated handling. Some fines produced upon repeated handling of crushed sizes. (Example: standard ferromanganese)
5	Appreciable reduction in size in repeated handling of large pieces. Appreciable fines may be produced in the handling of crushed sizes. (Example: 50 % ferrosilicon)
6	This category represents the most friable alloys. (Example: calcium silicon)

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